

Albinism in a wild Caribbean night monkey (*Aotus griseimembra*) in a fragmented landscape in Colombia

Albinismo en un mono nocturno caribeño (*Aotus griseimembra*) silvestre en un paisaje fragmentado en Colombia

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Albinism results from the complete absence of melanin due to mutations in the OCA and TYR genes. This condition has been considered rare in primate species and could affect the survival and intraspecific interactions of individuals. The aim of this note is to report albinism in a wild individual of the Caribbean night monkey (*Aotus griseimembra*) in a fragmented landscape in Santander, Colombia. During 2020 and 2021 we visited the sleeping site of a Caribbean night monkey social group that inhabits a small fragment of forest surrounded by pastureland used for livestock and palm crops. Within the social group we recorded a juvenile individual of unknown sex with evident albinism, which shares its sleeping site with 3 other individuals with normal coloration. Unlike diurnal species, records of albino individuals in nocturnal primates are scarce and have been null for New World night monkeys (*Aotus* spp.). Therefore, it is likely that, in these nocturnal species, albinism imposes additional survival challenges. There is a need to obtain ecological and genetic data to understand the origins and implications of albinism in the Caribbean night monkey.

Key words: Abnormal coloration; habitat loss; melanin; New World primates; Santander; survival.

El albinismo es el resultado de la ausencia completa de melanina producto de mutaciones en los genes OCA y TYR. Esta condición ha sido considerada rara en especies de primates y podría afectar la sobrevivencia y las interacciones intraespecíficas de los individuos. El objetivo de esta nota es reportar el albinismo de un individuo silvestre del mono nocturno caribeño (*Aotus griseimembra*) en un paisaje fragmentado en Santander, Colombia. Durante 2020 y 2021 visitamos el dormitorio de un grupo social del mono nocturno caribeño que habita un pequeño fragmento de bosque rodeado por pastizales destinados a ganadería y cultivos de palma. Dentro del grupo social registramos a un individuo juvenil de sexo desconocido con evidente albinismo, el cual comparte su dormitorio con 3 individuos más con coloración normal. A diferencia de especies diurnas, los registros de individuos albinos en primates nocturnos son escasos y han sido nulos para los monos nocturnos del Nuevo Mundo (*Aotus* spp.), por lo tanto, es probable que, en estas especies de hábitos nocturnos, el albinismo imponga retos adicionales de sobrevivencia. Es necesario obtener datos ecológicos y genéticos que permitan entender los orígenes e implicaciones del albinismo en el mono nocturno caribeño.

Palabras clave: Coloración anormal; melanina; pérdida de hábitat; primates del Nuevo Mundo; Santander; sobrevivencia.

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Coloration patterns in primates result from a combination of factors such as hemoglobin, structural coloration and melanin pigmentation ([Bradley and Mundy 2008](#)). In the case of melanin pigmentation, there are different abnormal conditions produced by the absence of this pigment in specific parts or the whole body of the individuals. For example, the absence of melanin in small specific regions of the body is known as piebaldism, the partial absence of melanin in a large part of the body is known as leucism, and the complete absence of melanin is known as albinism ([Fertl and Rosel 2002](#); [Miller 2005](#); [Acevedo and Aguayo 2008](#)). Albinism has been associated with at least 18 mutations, mainly related to the TYR and OCA2 genes ([Hutton and Spritz 2008](#); [Grønskov et al. 2009](#); [Summers 2009](#); [Hu et al. 2011](#); [Bridge et al. 2014](#); [Montoliu and Kelsh 2014](#); [Montoliu et al. 2014](#)). The most common condition of albinism,

is oculocutaneous albinism (OCA) which is an autosomal recessive inherited disorder characterized by reduced or absent melanin biosynthesis in melanocytes of the skin, coat and eyes ([Spritz 1994](#); [Oetting and King 1999](#)). So far, four different types of OCA have been identified (OCA1, OCA2, OCA3 and OCA4) which are difficult to distinguish based on clinical diagnoses and are caused by mutations in different genes that can be identified from molecular analyses ([Grønskov et al. 2007](#)).

Albinism is a condition considered rare in primates ([Mahabal et al. 2012](#); [Abreu et al. 2013](#)) as it may convey negative consequences (e.g., reduced survival) due to their conspicuous appearance that might make them more susceptible to predation ([Owen and Shimmings 1992](#); [Caro 2005](#)). Additionally, individuals with albinism exhibit reduced visual acuity and neurological changes

([Bridge et al. 2014](#)). Individuals with albinism may also present problems such as ostracism ([Slavík et al. 2015](#)) infanticide ([Leroux et al. 2021](#)) and are usually not reproductively selected ([Peles et al. 1995](#); [Delibes et al. 2013](#)). Despite this, in the wild, subadult and adult individuals with albinism have been recorded sharing with other individuals with normal colorations in several primate species from both the Old World ([Mahabal et al. 2012](#); [Le Pors et al. 2019](#)) and New World ([Duquette et al. 2015](#); [López-Platas et al. 2021](#)). There have even been reports of albino individuals that have successfully reproduced and whose offspring have normal coloration ([Le Pors et al. 2019](#)). There is also evidence of albinism in individuals of primates born in captivity or recovered from illegal trafficking as infants or juveniles ([Prado-Martínez et al. 2013](#); [Espinal et al. 2016](#); [de Vasconcelos et al. 2017](#); [Koga et al. 2020](#); [Wu et al. 2020](#)).

One of the most northern distributed night monkeys is the Caribbean night monkey, *Aotus griseimembra*, which inhabits the lowland tropical forests of northern South America, in Venezuela and Colombia. The distribution of the Caribbean night monkey in Colombia covers much of the lowland forests of the north of the country and the inter-Andean forests of the middle Magdalena valley, two of the regions most affected by deforestation and where the landscape is dominated mainly by pastures used for livestock and crops ([Etter and van Wyngaarden 2000](#); [Etter et al. 2008](#); [Link et al. 2021](#)). This primate is currently categorized as vulnerable to extinction mainly because of habitat loss due to the pervasive transformation of forests into agricultural fields and urban areas ([Link et al. 2021](#)). The risk of extant wild populations remains high as only approximately 17 % of the distribution of the Caribbean night monkey is within protected areas ([Henao-Díaz et al. 2020](#)).

The Caribbean night monkey is medium-sized (approximately 800 gr and 30 cm) and normally has a pelage on the dorsum brown and light yellow belly. The dorsal surface of the hands and feet is usually dark brown and the end of the limbs are darkly colored ([Defler 2010](#)). This note aims to report a wild individual of the Caribbean night monkey with albinism, which lives with its social group in a small forest fragment in Santander, Colombia.

Based on a personal communication from a resident suggesting the presence of a Caribbean night monkey with atypical coloration, we visited on three occasions (between August 2020 and August 2021) their habitual sleeping, a large tree of the genus *Ficus* sp. where a group of Caribbean night monkeys sleeps during daytime at about 15 m high. The group lives in a small forest fragment surrounded by guanabana, papaya and citrus tree, and immersed in a mosaic of pastures used for livestock and extensive palm oil crops. The study area is located in the vereda Patio Bonito in the municipality of Puerto Parra, Santander (6° 41' 59" N, 73° 58' 29" W; 135 m; Figure 1). We assigned an age category to each of the individuals observed based on their size and the presence of a spot at the ventral base of the tail, which is darker in adult individuals ([Montilla et al. 2021](#)).

The group of Caribbean night monkeys has an individual with albinism evidenced by a total absence of pigment in its entire body, including its skin, coat and red eyes (Figure 2). We observed this albino Caribbean night monkey always in the sleeping area together with 3 other individuals with normal coloration. The albino Caribbean night monkey is a large juvenile almost the size of a subadult of unknown sex and lives with 3 other individuals, 2 correspond to a heterosexual adult couple that are probably the parents of the albino. The other individual corresponds

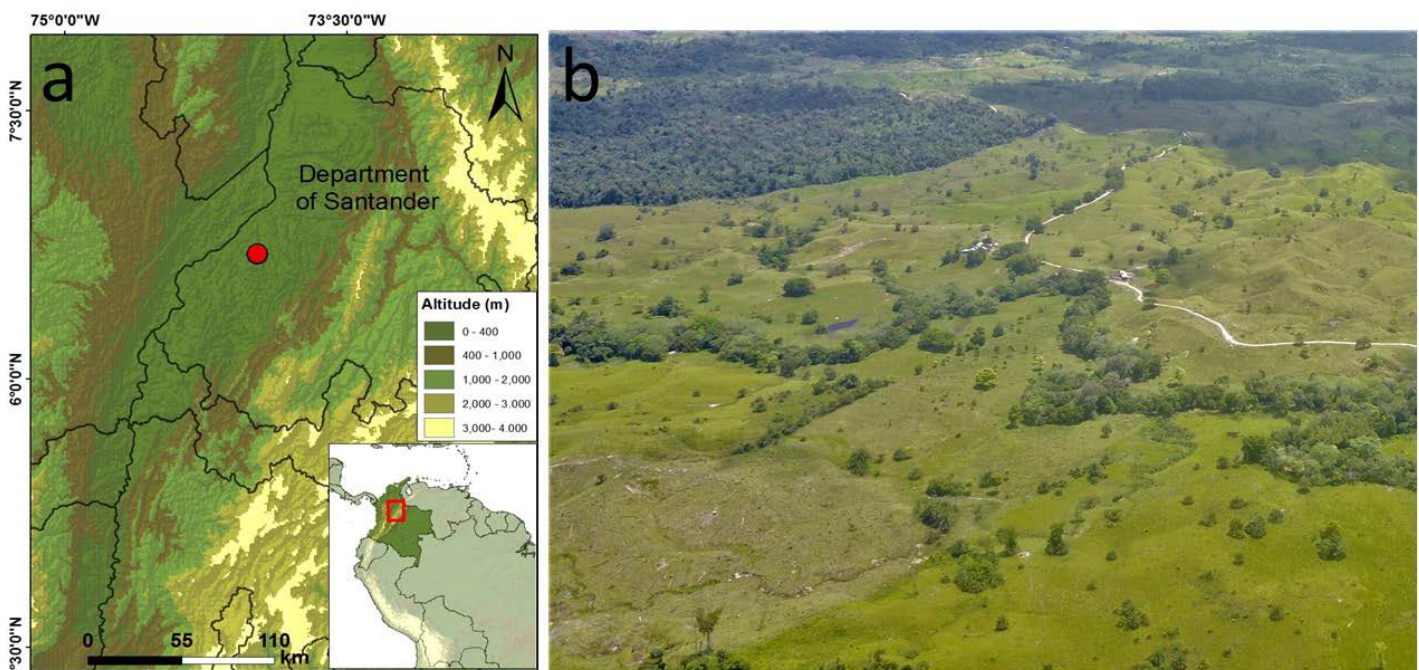


Figure 1. a) Geographical location of the albino Caribbean night monkey, *Aotus griseimembra*, and its social group in Santander, Colombia. b) Fragmented landscape where inhabits the albino Caribbean night monkey and its social group.

to a smaller juvenile of unknown sex that is most probably the younger brother of the albino. After detecting the presence of observers, all group members came out of the sleeping cavity and were alert. It was evident that the albino Caribbean night monkey has visual difficulties and tends to strain his eyes more than the rest of the individuals without pigmentation anomalies.

Given the complete absence of pigmentation in the Caribbean night monkey recorded in Santander, Colombia, we consider it most certainly has a condition of albinism and no other pigmentation disorders such as leucism or piebaldism (Fertl and Rosel 2002; Miller 2005; Acevedo and Aguayo 2008). Albinism has been associated with low genetic diversity, genetic inbreeding, loss of habitat quantity and quality, pollution and environmental stress (Bensch et al. 2000; Camargo et al. 2014). The albinism of the Caribbean night monkey is likely related to one or more of these factors as it inhabits a small fragment of a highly transformed forest. Local people indicate that this is not the first individual with this condition in the forest fragment and that they have observed at least 3 more albinos within the same social group.

Although the condition of albinism has been recorded in individuals of several primate species throughout the world (Prado-Martinez et al. 2013; Duquette et al. 2015; Espinal et al. 2016; Le Pors et al. 2019; Leroux et al. 2021; López-Platas et al. 2021), reports for nocturnal species have been scarce. In night monkeys (*Aotus* spp.), there are not published records of individuals with albinism. For other strepsirrhine or catarrhine nocturnal primates, there is only one report of albinism, in an individual of unknown sex of the cathemeral crowned lemur (*Eulemur coronatus*), which carries on its back an offspring of normal coloration (Le Pors et al. 2019). Like all night monkey species of the genus *Aotus*, Crowned lemur does not have trichromatic vision like most catarrhines (Jacobs 2009). Therefore, it is possible that albinism in these species where color vision is limited, does not have behavioral pressures and even individuals with this condition can reach adulthood and reproduce. This is contrary to what has happened with diurnal primates such as the eastern chimpanzee (*Pan troglodytes schweinfurthii*). A case of an infanticide of one individual with albinism was recently recorded (Leroux et al. 2021). However, it is also possible that albinism imposes additional challenges to nocturnal or catemeral primates. The few records of albinism in species with these activity patterns are related to low survival of albino individuals, which are more conspicuous at night to predators (Miller 2005).

A behavioral study of the albino Caribbean night monkey would offer a unique opportunity to better understand the challenges imposed by pigmentation anomalies in the ecology and social behavior of primates with nocturnal habits. Moreover, it is of great importance to conduct genetic studies to determine the origin of albinism in the Caribbean night monkey and its resemblance or not, with genetic mutations associated with albinism.

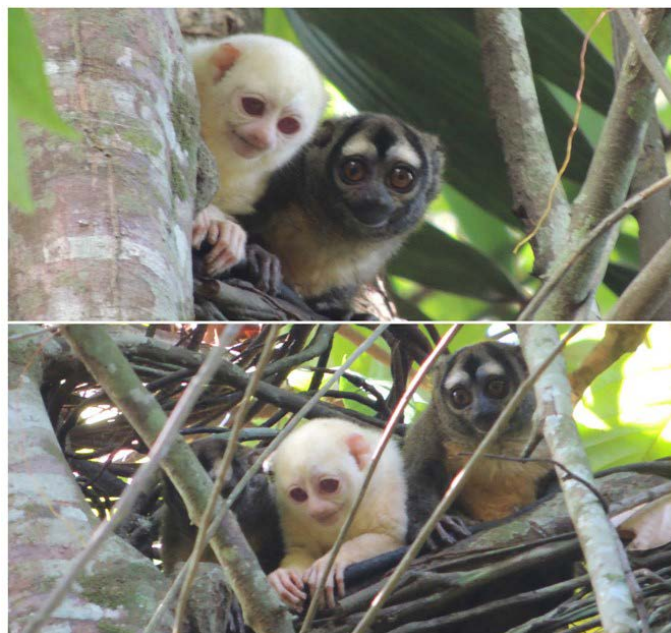


Figure 2. Albino individual of the Caribbean night monkey, *Aotus griseimembra*, together with individuals of its social group with normal coloration in Santander, Colombia.

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